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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/654,214	09/01/2000	James R. Kliegel	004210.P001	6134

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EXAMINER	
ROSALES HANNER, MORELLA I	

ART UNIT	PAPER NUMBER
2128	

DATE MAILED: 01/29/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/654,214	KLIEGEL, JAMES R.	
	Examiner	Art Unit	
	Morella I Rosales-Hanner	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *01 September 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Objections

1 Specification

1.1 The background is objected to because of the following informalities: [**page 2, line 16**] applicant discloses: "...*method for* ***he*** *Boltzmann equation*..." instead of "...*method for* ***the*** *Boltzmann equation*..." Appropriate correction is required.

1.2 The Summary of Invention is objected to because of the following informalities: [**page 7, line 5**] applicant discloses "... solving the **century** old quest for the solution to this classical problem." The Examiner finds this statement inconsistent with the background portion of this application where the applicant states that theoretical analysis of fluid motions began in the modern scientific sense with Newton's Principia (1687). Appropriate correction is required.

1.3 The attempt to incorporate subject matter into this application by reference [**page 7, line 23**] and [**page 17, line 3**] to applicant's co-pending application entitled "***Method for Algebraically Solving Differential Equations, including Stiff Equations, to High Accuracy***" is improper because it doesn't provide the application serial number. The applicant is requested to provide the serial number for the co-pending application.

1.4 The specification portion of this application contains an Appendix [**Pages 18 – 54**] listing **Equation Set 1 thru 18**. In accordance with **37 CFR 1.96(c)**, an Appendix

must be submitted as part of an application to provide a computer listing printout of more than three hundred (300) lines. Such appendix must be submitted as a compact disc conforming to the standards set forth in **37 CFR 1.96(c)(2)** and must be appropriately referenced in the specification (**see 37 CFR 1.77(b)(4)**). Accordingly, applicant is required to replace all references to the specific parts of the referred Appendix from the specifications and claims portions of the application, such as [**page 11, line 15**], with explicit listing of the corresponding mathematical equations in compliance with **37 CFR 1.52 (a) and (b).**

2 Information Disclosure Statement

2.1 The listing of references in the specification is not a proper information disclosure statement. **37 CFR 1.98(b)** requires a list of all patents, publications, or other information submitted for consideration by the Office, and **MPEP § 609 A(1)** states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form **PTO-892**, they have not been considered. The applicant is requested to provide a new Information Disclosure Statement that list co-pending application cited in the specification as well as prior art cited commencing on **page 4, line 8** and ending on **page 6, line 7**.

Claim Rejections - 35 USC § 101

3 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3.1 **Claims 1 - 18 are** rejected under 35 U.S.C. 101 because the claimed invention is not supported by either a specific and substantial asserted utility or a well-established utility. The Applicant discloses **[page 9, line 6]** that predictions of turbulent transition locations, turbulent energy growth rates, shears and other thermal and turbulent flow quantities of physical importance can now be derived or calculated from solutions of the disclosed equations with the same accuracy and computer resources as current laminar flow analysis or calculations. **Claims 1- 18** fail to recite analysis done in a computer, by carrying out as a series of steps, and could be performed by hand, which is considered not useful in the technological arts therefore, considered not patent eligible subject matter. Additionally, the claim discloses an abstract idea or pure mathematical algorithm.

Claim Rejections - 35 USC § 112

4 The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4.1 **Claims 2, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17** and **18** rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling.

4.1.1 As regard to **claims 2, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17** and **18,** the Applicant refers to different Equation Sets (included in a improper Appendix) that are critical or essential to the practice of the invention, but not included in the claims. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). These Equation Sets are considered critical or essential since they are part of the method of analyzing anisotropic turbulent flows of an anisotropic fluid claimed by the Applicant.

4.1.2 As regard to **claim 16,** the Applicant refers to solving the total thermal energy equation [**line 8**] and setting density equal to a constant [**line 10**] but fails to specifically disclose the total thermal energy equation, the density or which constant to use. The omitted subject matter is critical or essential to the practice of the invention, but not included in the claim is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). This subject matter is consider critical since one of ordinary skills in the art could not know which total thermal energy equation, density or constant is required to correctly analyze turbulent flows of an isotropic liquid.

5 The following is a quotation of the second paragraph of 35 U.S.C. 112:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5.1 Claims 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 and 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5.1.1 As regard to **Claim 2,** the claim recites the limitation " equations governing time average turbulent directional kinetic energy " **[line 2]** and Equation Set 12 **[line 3]**. There is insufficient antecedent basis for these limitations in the claim.

5.1.2 As regard to **Claim 4,** the claim recites the limitation " the density gradient independent time average thermal moment closure relationships" **[line 2]** and Equation Set 16 **[line 3]**. There is insufficient antecedent basis for these limitations in the claim.

5.1.3 As regard to **Claim 5,** the claim recites the limitation " the density gradient independent time average turbulent moment closure relationships" and Equation Set 17 **[line 2]**. There is insufficient antecedent basis for these limitations in the claim.

5.1.4 As regard to **Claim 6,** the claim recites the limitation " solving (n+1)th and (n+2)th order moment sets" **[line 1]**. There is insufficient antecedent basis for these limitations in the claim.

5.1.5 As regard to **Claim 7,** the claim recites the limitation " are defined by Equation 15" **[line 2]**. There is insufficient antecedent basis for this limitation in the claim.

5.1.6 As regard to **Claim 8,** the claim recites the limitation "Equation 15-3" **[line 2]**. There is insufficient antecedent basis for this limitation in the claim.

5.1.7 As regard to **Claim 9,** the claim recites the limitation " solving Equation 15-4" **[line 2]**. There is insufficient antecedent basis for this limitation in the claim.

5.1.8 As regard to **Claim 10,** the claim recites the limitation " solving Equations 15-5 and 15-6" **[line 2]**. There is insufficient antecedent basis for this limitation in the claim.

5.1.9 As regard to **Claim 11,** the claim recites the limitation " by solving Equation 15-7" **[line 2]**. There is insufficient antecedent basis for this limitation in the claim.

5.1.10 As regard to **Claim 12,** the claim recites the limitation " by solving Equation 15-8" **[line 2]**. There is insufficient antecedent basis for this limitation in the claim.

5.1.11 As regard to **Claim 13,** the claim recites the limitation " by solving Equation 15-9" **[line 2]**. There is insufficient antecedent basis for this limitation in the claim.

5.1.12 As regard to **Claim 14,** the claim recites the limitation " by solving Equations 15-10 and 15-11" **[line 2]**. There is insufficient antecedent basis for this limitation in the claim.

5.1.13 As regard to **Claim 15,** the claim recites the limitation " by solving Equation 15-12" **[line 2]**. There is insufficient antecedent basis for this limitation in the claim.

5.1.14 As regard to **Claim 16,** the claim recites the limitation " solving the total thermal energy equation" **[line 8]** and "setting density equal to a constant" **[line 10]**. There is insufficient antecedent basis for these limitations in the claim.

5.1.15 As regard to **Claim 17,** the claim recites the limitation " solving the resultant equation set". There is insufficient antecedent basis for this limitation in the claim.

5.1.16 As regard to **Claim 18**, the claim recites the limitation " the resulting turbulent flow equation set" in **line 1**. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6.1 Claims 1, 8, 9, 10 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by a printed publication by James R. Kliegel titled 'Maxwell Boltzmann Gas Dynamics' published in the proceedings of the 17th International Symposium on Rarefied Gas Dynamics, July 8-14 1990, Aachen, Germany, hereafter referred to as *Kliegel.*

6.1.1 As regard to **claims 1 and 16**, the *Kliegel* reference teaches **[page 58, paragraph 1]** a set of functions that is used to derive a solution to the Boltzmann equation, for a gas with unequal kinetic energies, which is simple and involves no complex mathematics. *Kliegel* further teaches **[page 59, paragraph 4]**:

- the use shear stress component and heat flux components to calculate shear stress component and heat flux components in defining equations governing velocity moments;
- an equation that defines the directional kinetic energies, the shear stresses, directional kinetic energy transfer moment; and
- structure correlation between velocity components.

Kliegel also teaches **[page 61, paragraph 2]** that it appears that the physics of fluid motion is such that one should represent the state of a gas by its density, mean velocity, and directional temperatures. Using this observation *Kliegel* disclosed equations of motion **[page 61]** in particular, directional kinetic energy equations that may be used to derive shear stresses and heat flux components. *Kliegel* goes on to teach a solution to Maxwell Boltzmann equation utilizing close moment connection between colliding and collided molecular velocity distribution functions yielding a closed time average turbulent moment equations.

6.1.2 As regard to **claims 8, 9 and 10**, *Kliegel* teaches **[page 61, paragraph 4]** that directional kinetic energy equations may be summed to yield classical energy conservation equations and derives explicit expressions for shear stresses and heat flux components in the directional kinetic energy equation **[page 61, equation 33]**.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7.1 Claims 11, 12, 13, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over a printed publication by James R. Kliegel titled 'Maxwell Boltzmann Gas Dynamics' published in the Rarefied Gas Dynamics dated 1991, hereafter referred as *Kliegel* in view of a printed publication by Shiyi Chen and Gary D. Doolean, titled 'Lattice Boltzmann Method for Fluid Flows' published in pages 329 – 364 of the 1998 Annu. Rev. Fluid Mech. Hereafter referred as *Chen et al.*

Kliegel teaches a series solution of the Boltzmann equation [**page 62**] where the time derivative terms have been eliminated through use of the Euler form (zero shear stresses and directional kinetic energy transfer) of the equation of motion. *Kliegel* fails to explicitly teach a method of a time average method of analyzing thermal correlation, directional turbulent energy or turbulent shear.

The *Chen et al.* references teaches [**page 329, paragraph 1**] that:

- the fundamental idea of the lattice Boltzmann method is to construct simplified kinetic models that incorporate the essential physic of microscopic or mesoscopic processes so that the macroscopic averaged properties obey the desired macroscopic equations,
- by developing a simplified version of the kinetic equation, one avoids solving complicated kinetic equations such as the full Boltzmann equation, and

- even though the lattice Boltzmann method is based on a particular picture, its principal focus is the averaged macroscopic behavior.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the teachings of *Kliegel* with the teachings of *Chen et al.* to come up with a method of analyzing averaged macroscopic behaviors such as correlation, directional turbulent energy and shear.

Response Guidelines

8. A shortened statutory period to response to this action is set to expire **3 (three) months** and **0 (zero) days** from the date of this letter. Failure to respond within the period for response will cause the application to become abandoned (see MPEP 710.02, 710.02(b)).

Any response to the Examiner in regard to this non-final action should be directed to:

Morella Rosales-Hanner
Telephone number (703) 305-8883
Monday-Friday from 7:00 a.m. to 3:30 p.m. ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska can be reached on 703 305-9704. Any inquiry of a general nature should be directed to the Technology Center (TC) 2100 receptionist, telephone number (703) 305-3900. The TC 2100 receptionist, telephone number (703) 306-5631.

Mailed to: Commissioner of Patents and Trademarks
Washington, D.C. 20231

Or faxed to: (703) 872-9306

Hand-delivered responses should be brought to:

Crystal Park II, 2121Crystal Drive,
Arlington, VA, Fourth Floor (Receptionist)

Morella Rosales-Hanner

12/31/2003

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